Design Guidelines for Flood-Based Farming Systems

Proposal for publication through
ICID, WG-DROUGHT

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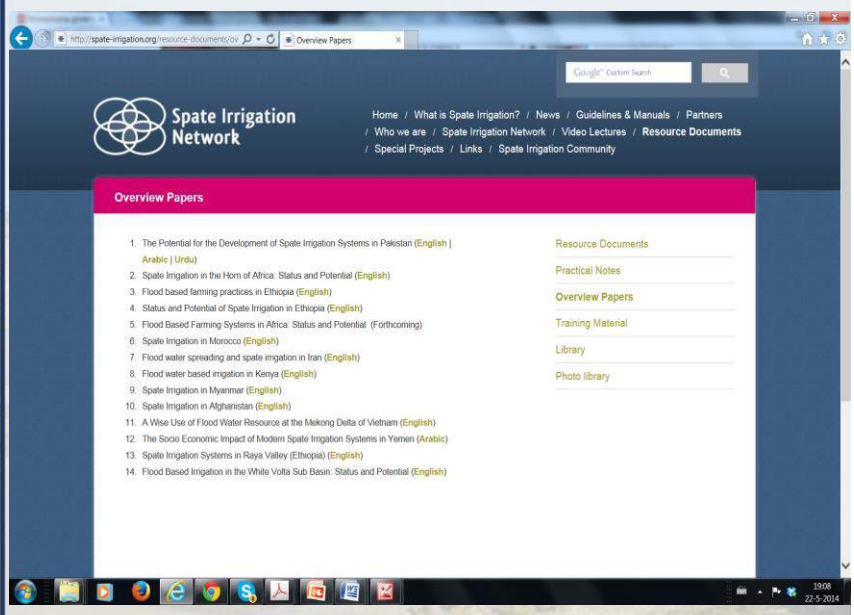
What are Flood-based Farming Systems (FBFS)?

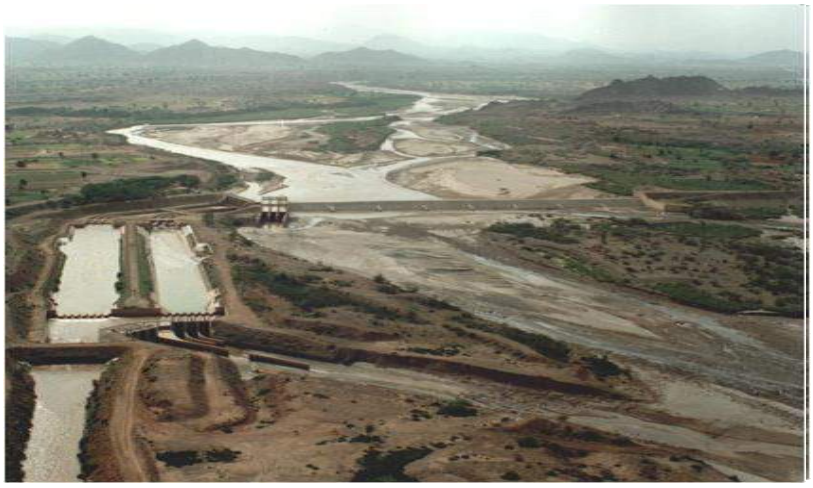
- Reversing the destructive nature of floods into blessing for multiple use:
  - Increased cropped area: cereals, oil seeds, pulses, fruit trees
  - Better groundwater recharge
  - Forest and rangeland support
  - Domestic and livestock water supply
  - Rehabilitation of degraded environments
  - Balance with ecological functions

Why are we interested in FBFS?

- They constitute poverty pockets – they are central to our effort to lift 700 million people out of poverty
- They are significant: 15 Million ha in arid and semi-arid regions in SSA
- They are quintessential adaptation to extended drought and occasional floods – climate variability and change
- They contribute to environmental sustainability
- They are orphans left-out between rain-fed and convention irrigated Agriculture



Sophisticated diversion in Yemen – 20,000 ha – built in 1978 – still operation, but with many difficulties

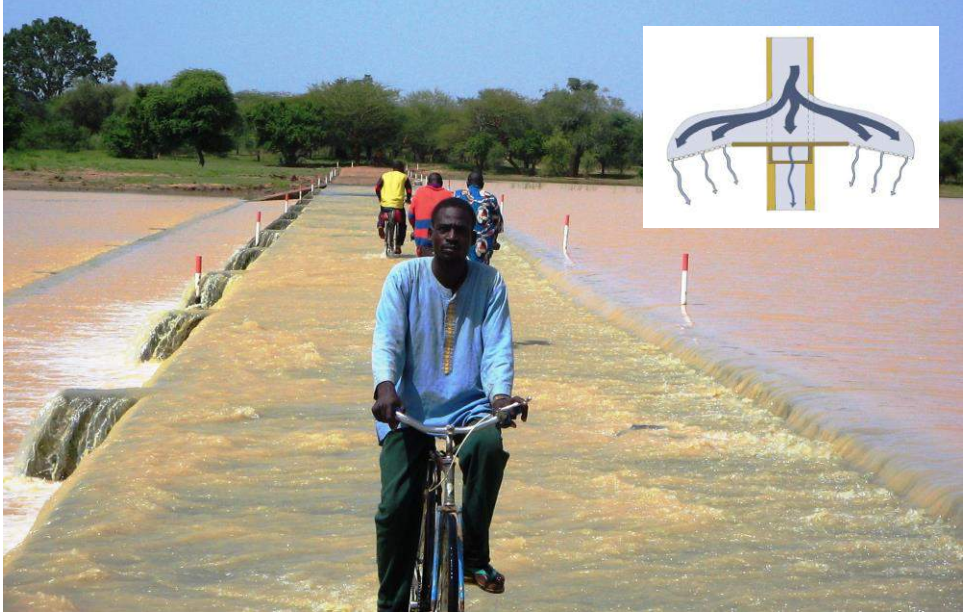


Innovations in Flood water management - Pakistan

- Main innovation: combination of gabion and masonry: maintaining safety at a lower cost. Gabion cost is about one fifth of masonry.

- FULACHI / NIGER (slide by Nill, GIZ)
  Rehabiliate degraded land, improve groundwater recharge and productivity

NIGER: FLOOD WATER SPREADING WEIR = ROAD



Innovations in flood water management – invest in the command area - Pakistan

Low recharge weir to slow down and spread floods (Yemen)

Open off-take - Dayu Scheme:
3 m wide, 120°
Design capacity: 380 ha
Actually irrigated: 200 ha

Pipe off-take at Tirke spate irrigation scheme before and after it was filled with sediment

Incremental research - evolution of small scale flood-based irrigation design in Tigray, Ethiopia

2002 and before
Closed conduit gate (1 m); 90°
- Design capacity: 400 ha
- Actual capacity: 0 ha

2005
Closed rectangular gate (1 m); 90°
- Design Capacity: 400 ha
- Actual capacity: 0 ha

2008 to 2010
Open gate (3m); 120°
- Design capacity: 500
- Actual capacity : 300

Now (2014)
Open gate (5 m); 120° and 150°
- 500 ha – under construction with funding from PASIDIP(IFAD)

Soil Moisture Conservation - Innovation

Spate Irrigation course in five higher education institutions

- Yemen: Sana'a University, Yemen: Water and Environment Centre
- Ethiopia: Mekelle University, Ethiopia: Institute of Water and Environment
- Pakistan: PMAS Arid Agriculture University Rawalpindi Gomal Zam University, di khan
- Sudan: Universities of Gezira and Khartoum: Draft course ready, official procedures under way
- Netherlands: Short course at UNESCO-IHE Institute for Water Education

There is a need for new generation of water professionals

With the capacity to go beyond the standard design approaches of conventional irrigation that has failed to:

- Appropriately take into account the level of uncertainty related to floods,
- the hydraulic challenge of guiding flood flows, the heavy sediment loads,
- the exceptional nature of the water rights, or the management and maintenance needs.

Publication: Design Guidelines on Flood-based Farming Systems - Status

- August, 2013: Funding secured from IFAD and DUPC
- 28 to 31 , 2013: planning meeting in Ethiopia among the main implementing partners - UNESCO-IHE, MeMeta, Mekelle University, Ethiopia; Hydraulic Research Centre, Sudan - under the leadership of Professor Bart Schultz:
  - Unanimously agreed to publish the Guidelines through ICID, WG-Drought
  - Draft table of contents – chapters and major sub-topics - finalized
  - Responsibilities assigned to finaize draft chapters by December, 2014-
- 18 September, 2014: 7 of the 11 draft chapters received

Table of Content: Main Chapters and Sub-topics

Chapter 1: Introduction (draft ready)

Chapter 2: Background and Rationale

Chapter 3: Flood based irrigation systems (draft ready)

- Definition
- Types and characteristics
- Status and potential
- Design challenges

Chapter 4: Hydrology and water resources analysis (draft ready)

- Catchment characteristics
- Flood analysis (rainfall analyses included)
- Groundwater potential
- River morphology and sediment analyses

Table of Content: Main Chapters and Sub-topics

Chapter 5: Design of water diversion **(draft ready)**

- Design strategy/consideration (command area included)
- Geotechnical investigation
- Sediment management
- Hydraulic design
- Structural design

Chapter 6: Design of water conveyance and distribution systems **(draft ready)**

- Design strategy/consideration
- Canal design (layout, profiles, distribution structures, materials ..)

Chapter 7: Design of on-farm water managements systems

- soils (including soil moisture management)
- agronomy
- field water management (water rights and scheduling, water distribution, field structures and practices, drainage techniques, conjunctive water use)

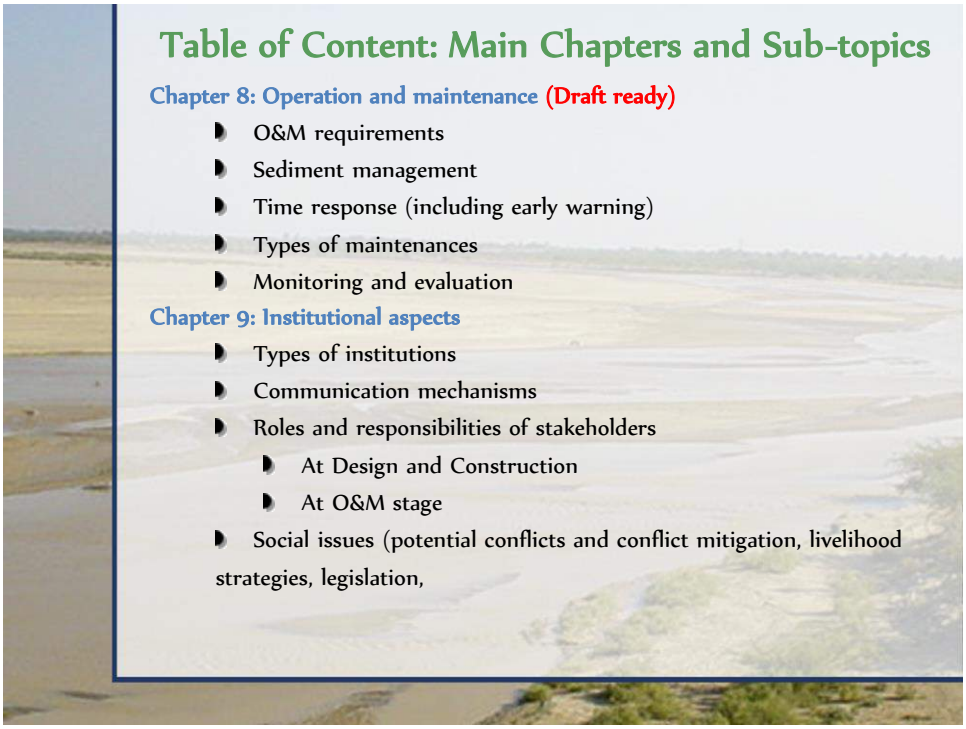


Table of Content: Main Chapters and Sub-topics
Chapter 8: Operation and maintenance (Draft ready)
O&M requirements
Sediment management
Time response (including early warning)
Types of maintenances
Monitoring and evaluation
Chapter 9: Institutional aspects
Types of institutions
Communication mechanisms
Roles and responsibilities of stakeholders
At Design and Construction
At O&M stage
Social issues (potential conflicts and conflict mitigation, livelihood strategies, legislation,